AN ANALYSIS OF THE SOURCES OF IMPORT GROWTH IN TURKEY : 1985-90

A THESIS PRESENTED BY OYA CELASUN

TO

THE INSTITUTE OF

ECONOMICS AND SOCIAL SCIENCES

IN PARTIAL FULFILLMENT OF THE

REQUIREMENTS

FOR THE DEGREE OF MASTER OF

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Oya Celasun

tarafından bağışlanmıştır.

I certify that I have read this thesis and in my opinion it is fully adequate, in scope and in quality, as a thesis for the degree of Master of Economics.

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ABSTRACT

AN ANALYSIS OF THE SOURCES OF IMPORT GROWTH
IN TURKEY: 1985-90

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June 1995

The sources of import growth in Turkey during the 1985-90 period are decomposed into four casual factors: domestic demand expansion, export expansion, import substitution and technological change, using the input-output framework. Domestic price indices for imports and gross output were constructed, and the 1990 input-output table was double deflated into constant 1985 prices. The decomposition results are analyzed within the context of the economic conditions in Turkey during the period. It is observed that the structure of the causal factors have changed compared to the previous period of 1979-85. The contribution of export expansion is observed to be negligible, and domestic demand expansion and import substitution are the most prominent sources of import growth between 1985 and 1990.

Key Words : Input-Output, Decomposition Anaylsis, Double Deflation.

ÖZ

1985-90 DÖNEMİNDE TÜRKİYE'DEKİ İTHALAT BÜYÜMESİNİN KAYNAKLARININ ANALİZİ

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1985-90 döneminde Türkiye'deki ithalat büyümesinin kaynakları girdi-çıktı çerçevesi içinde dört nedensel faktöre ayrıştırılmıştır: nihai talep büyümesi, ihracat büyümesi, ithal ikamesi ve teknolojik değişim. İthalat ve gayrısafi çıktı için yurtiçi fiyat endeksleri oluşturulmuş, ve 1990 girdi-çıktı tablosu ikili deflasyon yöntemi ile 1985 fiyatlarına çevrilmiştir. Ayrıştırma sonuçları Türkiye'nin o dönemki ekonomik durumu çerçevesinde incelenmiştir. Sonuçlar, nedensel faktörlerde 1979-85 dönemine göre yapısal değişiklikler olduğunu göstermektedir. 1985-90 döneminde, ihracat büyümesinin katkısının ihmal edilebilir, nihai talep büyümesi ve ithal ikamesinin ise en önemli iki kaynak olduğu görülmektedir.

Anahtar kelimeler : Girdi-çıktı, Ayrıştırma Analizi, İkili deflasyon.

ACKNOWLEDGEMENTS

I wish to express my gratitude to Prof.Dr. Sübidey Togan for his supervision and constant interest. I am grateful to Assoc.Prof. Nedim Alemdar for his valuable comments and constructive suggestions for the improvement of my study. I am also grateful to Assoc.Prof. Osman Zaim for his valuable comments. All remaining errors are mine.

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CHAPTER I
INTRODUCTION

The balance of payments crisis during the late seventies forced the Turkish authorities to abandon the 'import substitution' policies followed until 1980, and encouraged them to adopt outward oriented export promoting strategies from then on. As a result, exports surged up from 3.4 percent of GNP in 1979 to about 16 percent in 1987 and 1988. The growth of exports was largely facilitated by the devaluations of the early 1980s. However, the TL was revaluated against the US$ after 1988; the TL appreciated about 40 percent in the 1988-90 period. The 50 percent increase in real wages during the same period contributed to the decline of competitiveness of the Turkish economy. Although the year 1988 saw a current account surplus of about 1.5 billion followed by a smaller one in 1989, the balance deteriorated in 1990; exports accounted to only 59 percent of imports that year. The current account deficit did not recover until the substantial devaluation in early 1994, it reached a peak of $6.4 billion in 1993.[1]

The composition of the foreign trade of Turkey changed substantially from 1989 onwards in favor of imports. It is of considerable policy interest to determine what particular factors contributed to the import boom in 1985-90, and how they differed across sectors. The aim of the present study is to analyze the sources of import growth[2] of Turkey in 1985-90 (at the sectoral level) , using the most recent input-output tables available, namely those of 1985 and 1990.

The main method used in this study is decomposition analysis, which distinguishes and estimates the relative weights of the four causal factors of import growth:

1. Domestic Demand Expansion (DDE)
2. Export Expansion (EE)
3. Import Substitution (IS)
4. Technological Change (TC)

The first two factors represent the changes in imports caused by the expansion of demand for domestic final goods and exports respectively, assuming that the import structure of the economy is constant throughout the period under study. The third factor embodies the changes in the import structure of the economy. The IS term represents the change in imports induced by the change in the import structure of final and intermediate goods. Import substitution may be defined as the decreased share of imports, hence the increased share of domestic production in satisfying total demand. Then a positive contribution of the IS factor to import growth implies that there is negative import substitution in the sector, or in other words, import penetration and increased import propensity. The fourth factor represents the changes in imports arising due to the widening and deepening of interindustry linkages; that is the changes in the input-output coefficients. Such changes in intermediate use requirements may result from technological changes in the production processes, and/or substitution among different intermediates as a result of the changing conditions in the economy.

The results of the decomposition analysis of the sources of import growth are consistent with the broad conditions in the Turkish economy during 1985-90 .While domestic demand expansion was the most prominent contributor to import growth, export expansion lost its importance compared to the previous period of 1979-85. Negative import substitution was the second

largest factor in import growth. Technological change was also a positive contributor to import growth.

This method of decomposing import growth in to four sources, approaches the problem from the *sources of demand* side, rather than *the factor supply* side.

Another feature of the analysis carried out in the present study is that imports and domestic production will be formulated as fractions, or in other words as *shares* of total demand (or total supply), which may be called as the shares approach.

The decomposition measure employed in this study is 'first differences'. The four -decomposed- sources include the contributions of the first differences of the factors : second period value of domestic demand, exports, import ratio, and input-output coefficients minus the first period value of the corresponding factors. Similarly the first difference of imports will be decomposed[3].

The input-output (I-O) framework captures the direct and indirect effects of demand on growth, and the changes in the structure of the economy. The indirect *backward linkage effects*, that is, the induced changes in the demand for the intermediate inputs due to the changes in the demand for the final output of a sector are incorporated in the decomposition measures. This is the so called total decomposition approach.

In order to be able to carry out the study in real terms, it is necessary to deflate the 1985 and 1990 I-O tables. Since price data are not available for all the 64 sectors in the tables, the tables are aggregated into 9 sectors assuming that a fewer number of sectors is sufficient to find out the key determinants of structural shifts in import use. The deflation procedure is carried out in a manner that maintains the balance of supplies and demands in all sectors, and is thus named as the double deflation procedure. The flows in the 1985 and 1990 I-O tables are measured in producer's prices, domestic production includes indirect taxes on production. Since imports and exports need to be valued at a consistent manner, imports are measured as the value of imported goods at c.i.f.

prices plus import tariffs, and exports are measured at ex-factory prices. In a consistent manner, price indices need to be constructed for imports, gross output (domestic production), and exports.

A brief literature survey on decomposition analysis is presented in Chapter II, which clarifies the conceptual framework through examining certain contributions to the field of decomposition analysis. Chapter III describes the construction of price indices needed to deflate the 1990 I-O table in to 1985 prices, and the double deflation of the 1990 I-O table. The decomposition results are stated and compared with those of previous studies in Chapter IV .

NOTES

1. The developments in the Turkish economy in 1985-90 were summarized from Hatiboğlu (1995).
2. Growth analysis may be applied to the analysis of growth of gross output, imports and value added.
3. The first differences approach is explained in detail in Chapter II.

CHAPTER II

A LITERATURE SURVEY ON DECOMPOSITION ANALYSIS

2.1 Introduction

The models for sources of growth decomposition are used to decompose the causal factors that altogether lead to differences in the growth rates of production, value added, imports, factor use and relative prices on a sectoral basis. This framework was originally applied to the analysis of production, i.e. gross output growth, and later adapted to the analysis of the growth of related vectors mentioned above.

The following section briefly summarizes the development of the technique of sources of growth analysis. The debated issue of the treatment of import substitution is also briefly covered. Section 2.3 reviews the controversies about the topics of aggregation, indexation, and briefly reviews certain different methods that may be applied in the sources of growth analysis.

2.2 The Evolution of Decomposition Analysis and the Import Substitution Measurement Problem

In this section certain contributions in the evolution of decomposition analysis are highlighted[1]. The issue of the measurement of import substitution (IS) will also be summarized as a subject of much debate in empirical research of the field.

The framework of decomposition analysis was built by Chenery in his 'Patterns of Industrial Growth' (1960). This method of analyzing structural change takes the material balance equation as the starting point :

(2.1) $X_i=W_i + D_i + E_i - M_i$

where X_i = gross output of sector i

W_i = intermediate demand for the output of sector i

D_i = final demand for the output of sector i

E_i = export demand for the output of sector i

M_i = total imports of the commodities in sector i

The identity shows that in each sector, total supply, i.e. the sum of X_i and M_i equals total demand, the sum of intermediate and final demands, W_i and D_i plus export demand E_i.

Chenery assumed that imports in each sector to be a certain fraction , m_i, of the total demand in that sector [2]:

(2.2) $M_i = m_i(D_i+W_i+E_i)$

Then production in that sector can be written as :

(2.3) $X_i = (1-m_i)(D_i+W_i+E_i)$

where $(1-m_i)$ shows the fraction of total supply arising from domestic production, or in other words gross output.

As a measure of structural change, Chenery introduced the 'deviation from proportional growth' in each sector. Letting $\lambda=Y^1/Y^0$ denote the growth of income between the benchmark years, proportional growth in each sector implies :

$$(2.4) \qquad X_i^P = \lambda X_i^0 = \lambda(1-m_i^0)(D_i^0+W_i^0+E_i^0)$$

where the superscipt p shows proportional growth, 0 stands for the first year and 1 for the terminal year, and indicate the actual values. Then the following expression shows the deviation from proportional growth in each sector :

$$(2.5) \qquad \delta X_i = X_i^1-X_i^P = X_i^1-\lambda X_i^0 = (1-mi^0)(\delta Di+\delta Wi+\delta Ei) + (m_i^0-m_i^1)Z_i^1$$

where $Z_i^1 = X_i^1+M_i^1$ = total supply in sector i

This expression attributes the deviation of gross output in the sector i to four factors :

$(1-m_i^0)(\delta D_i)$ = deviation in domestic demand
$(1-m_i^0)(\delta W_i)$ = deviation in intermediate demand
$(1-m_i^0)(\delta E_i)$ = deviation in exports
$(m_i^0-m_i^1)Z_i^1$ = change in the import ratio (IS)

Here the decline in the import ratio between the two benchmark years multiplied by the total supply of the terminal year is given as the measure of positive import substitution. This corresponds to the change in the import content of total supply due to the deviation of the terminal year import ratio from that of the initial year.

Later, Chenery, Shishido and Watanabe (CSW, 1962) developed the decomposition analysis in the input-output framework, hence incorporating the interindustry linkages. This allowed accounting for not only the direct effects of the causes of growth of output as in Chenery (1960), but also for the indirect effects via the intermediate flows. Hence the Leontief inverse[3] enters the picture and the deviation of gross output from proportional growth becomes:

$$(2.6) \qquad \delta X_i = \sum_j r_{ij}^{1} (\delta D_j + \delta E_j - \delta M_j - \lambda T_j)$$

where r_{ij} = the ith row and jth column entry of the Leontief inverse

T_j = the change in the intermediate use of commodity j in the production of commodity i caused by a change in technology.

The above approach is named as the constant composition method as it does not employ the import ratio m, and thus does not express the imports as a fraction of total supply. Thus the IS measure becomes $-\sum_j r_{ij}^{1} \delta M_j$, capturing both the direct and indirect effects of the deviation of the level of imports in all the sectors.

Lewis and Soligo (1965) modified the decomposition technique developed by Chenery (1960), rather than the deviations measure, by using the first differences method. Lewis and Soligo start with the following identity:

$$(2.7) \qquad \Delta X = \Delta D + \Delta W + \Delta E - \Delta M$$

and go on to define the ratio $u_1=X_1/Z_1$ (Z1=total supply) as the ratio of 'total domestic production to total supply in the base period',(1965:103). Therefore the total change in gross output in any sector i is given by

(2.8) $\Delta X_i = u_i^0(\Delta D_i + \Delta W_i) + u_i^0(\Delta E_i) + (\Delta u_i)Z_i^1$

Here the demand expansion component of Chenery(1960) is further broken down into domesic and export demand components. However, both studies ignore the factor of technological change and the interindustry effects as described by the intermediate flows, two points which were captured by CSW (1962).

Eysenbach(1969) discussed that $(\Delta u)Z_i^1$ was not an exact measure of import substitution, since it implicitly embodied the increase in total supply between the two benchmark periods : $Z_i^1 = Z_i^0 + \Delta Z_i$. Morley and Smith (1970) however, stressed the appropriateness of using the terminal year demand in the measurement of IS. Their view was that IS itself was due to the changes in import ratios as well as the changes in total demands.

Morley and Smith criticised Chenery (1960) for not incorporating intermediate demands in their IS measures. They extended the idea of CSW (1962) in the sense of incorporating intermediates in to the analysis but opposed the CSW (1962) view of defining IS, stating that CSW (1962) 'did not preserve the original notion of import substitution as a decline in the ratio of a sectors imports to the total supply of its products' (1970:730). They defined IS as ' the *ex post* difference between actual imports in some period t and and what imports would have been had import ratios remained at the levels of the base period' (1970:730).

Morley and Smith introduced a redefinition of imports but maintained the Chenery (1960) approach in the definition of IS. In matrix notation, their redefined imports were M^* :

(2.9) $M^* = (I - A)^{-1} M$

where A is the input output coefficients matrix. Redefined total supply, Z_i^*, then becomes:

(2.10) $$Z_i^* = X_i + M_i^*$$

In this formulation, imports not only supplement, but may also substitute domestic production to satisfy total demand and this may take place for final and/or intermediate use. If imports of a sector are to be substituted, 'without induced rises in imported inputs or reductions in the supplies available for final demand in other sectors, production must be increased in not only the industry finally processing the good, but also in its supplier industries and in their supplier industries and so forth' (1970:729). The IS definition of Morley and Smith follows as the change domestic production needed to substitute for imports, the final demands being held constant.

(2.11) $$IS_i^* = (M_i^{0*} / Z_i^{0*} - M_i^{1*} / Z_i^{1*}) Z_i^{1*}$$

Letting $\lambda = GNP^1/GNP^0$. Morley and Smith state that the CSW definition of IS measures the changes in M_i/GNP^1, which is problematic as it could produce contradicting results depending on the relative growth rates of domestic production, imports and GNP.

Syrquin (1976) redefined the import and domestic production ratios. While m_i is the fraction of total demand supplied by the imports in sector i, u_i is the fraction of total demand supplied by domestic production, or domestic production for domestic demand:

(2.12) $$m_i = M_i/(D_i+W_i)$$

(2.13) $$u_i=(X_i-E_i)/(D_i+W_i)$$

A similar approach as Syrquin (1976) was adopted by Chenery and Syrquin (1977). Their definition of IS is in a manner 'that is related to policies affecting import proportions' (1977:240). Their model employs u_i as the proportion of total supply produced domestically:

(2.14) $\quad u_i = X_i/(W_i+D_i+E_i)$

Employing the usual material balance equation with W=AX and letting caps (^) denote diagonalized matrices, they obtain :

(2.15) $\quad X = (I - \hat{u}A)^{-1}\hat{u}(D+E) = R^d\hat{u}(D+E)$

where $\quad R^d = (I - \hat{u}A)^{-1}$

$\hat{u}(D+E)$ = final demand supplied from domestic production

Their deviation measure for X is as follows:

(2.16) $\quad \delta X = R_2^d\hat{u}_2\delta D + R_2^d\hat{u}_2\delta E + R_2^d\Delta\hat{u}\lambda Z_1 + R_2^d\hat{u}_2\Delta AX_1$

$R_2^d\hat{u}_2\delta D$ = effect of the deviation of domestic demand with a constant import structure in all sectors

$R_2^d\hat{u}_2\delta E$ = effect of the deviation of exports with a constant import structure in all sectors

$R_2^d\Delta\hat{u}\lambda Z_1$ = direct and indirect effects of changes in the import structure

$R_2^d\hat{u}_2\Delta AX_1$ = effects of changes in the input output coefficients

Chenery and Syrquin state that this formulation differs from those in former studies since only the domestic component of the deviation determines

influences on domestic output .This is achieved by the use of the modified Leontief inverse $R^d = (I - \hat{u}A)^{-1}$.

Chenery, Robinson and Syrquin (1986) distinguished between imports for intermediate and final use, denoting them M^w and M^f respectively. Letting u_i^w and u_i^f denote the proportion of intermediate and final demand produced domestically, they obtain the following material balance equations for domestic production and imports:

(2.17) $$X_i = u_i^w \sum_j a_{ij} X_j + u_i^f D_i + E_i$$

(2.18) $$M_i = m_i^w W_i + m_i^f D_i$$

where $m_i^w = (1 - u_i^w)$ and $m_i^f = (1 - u_i^f)$. In matrix notation:

(2.19) $$X = \hat{u}^w AX + \hat{u}^f D + E$$

(2.20) $$M = m'^w W + m'^f D$$

The solution for domestic production is then :

(2.21) $$X = (I - \hat{u}^w A)^{-1}(\hat{u}^f D + E) = R(\hat{u}^f D + E)$$

And output growth is decomposed as follows:

(2.22) $$\Delta X = R_2 \hat{u}_2^f \Delta D + R_2 \Delta E + R_2 \Delta \hat{u}^f D_1 + R_2 \Delta \hat{u}^w W_1 + R_2 \hat{u}_2^w \Delta A X_1$$

$R_2 \hat{u}_2^f \Delta D$ = domestic demand expansion

$R_2 \Delta E$ = export expansion

$R_2 \Delta \hat{u}^f D_1$ = import substitution for final goods

$R_2 \Delta \hat{u}^w W_1$ = import substitution for intermediate goods

$R_2 \hat{u}_2^w \Delta A X_1$ = changes in input output coefficients

where the subscripts show the time periods.

First differences instead of deviations are used to decompose the causes of growth in equation (2.22). Chenery, Robinson and Syrquin (1986) point out that import substitution is due to the changes in the ratio of imports to total demand in each sector which differs from the CSW (1962) formulation.

Syrquin applied the sources of growth analsis to imports. His adapted formulations will be used in this study. He defines u_i as domestic output for the domestic market:

(2.23) $u_i=(X_i-E_i)/(D_i+W_i)$

and m_i equals $M_i/(D_i+W_i)$ as usual. Starting from the following equations in matrix form, Syrquin obtains the first difference measures for gross output and imports.

(2.24) $X = \hat{u}\,(D+W) + E$

(2.25) $M = m'(D+W)$

The derivations in detail and the decomposition equations that will be used in this study are given in Appendix C.

2.3 Some Topics in the Empirical Field of Decomposition Analysis

2.3.1 The Aggregation Problem

A common problem is that it may not always be possible to find the input output data on a comparable basis for the benchmark years of the study. Aggregation on a sectoral basis may be required to ensure comparability. There have been different approaches towards this problem[5]. In this study, Desai's

(1969) method will be implemented. The method is characterized by the aggregation of the row data:

$$(2.26) \qquad \Delta X = \sum_j X_j^1 - \sum_j X_j^0$$
$$= (\sum_j X_j^0 / \sum_j Z_j^0) * (\Delta(\sum_j D_j) + \Delta(\sum_j W_j) + \Delta(\sum_j E_j))$$
$$+ ((\sum_j X_j^1 / \sum_j Z_j^1) - (\sum_j X_j^0 / \sum_j Z_j^0)) * (\sum_j Z_j^1)$$

2.3.2 First Differences versus Deviations Measure for Decomposition

In section 2.2 several studies using either differences or deviations measures were reviewed. Deviations measure quantifies the deviation of gross output from its proportional growth path in terms of the causes' deviations from their own paths. First differences measure takes the increments of the variables between the two benchmark years instead of the deviations. In this study, the first differences measure will be used for the sources of growth of imports analysis.

2.3.3 Total versus Direct Decomposition Methods

Decomposition using the total method gives the effects of the changes incorporating the indirect linkages via intermediate input flows. In direct decomposition, the interlinked nature of the economy is ignored, changes in the demands for intermediates is treated as an independent component of sectoral demand. Direct measures are useful when analysing the behaviour of particular sectors[6]. The total decomposition method is used in the present study.

2.3.4 The Index Number Problem

There is an index number problem implicit in decomposition analysis. The decomposition can be done by 'terminal year structural coefficients and the initial year volume weights or by initial year structural coefficients and the terminal year volume weights'[7]. The two versions are analogus to the Paache and Laspeyres indices respectively. The averages of the two decomposition results will be presented for this study.

NOTES

1 The notation of the reviewed papers are slightly changed with a common set of notation which is used throughout the chapter.
2 Chenery assumed that the import ratio m_i is a function of the income and population size.
3 The Leontief inverse is $R=(I-A)^{-1}$ where I is the identity matrix and A is the matrix of input output coefficients.
4 $\sum r_{ij}(\lambda m_j^0 - m_j^1) = GNP_1(\sum r_{ij}(m_j^0/GNP^0 - m_j^1/GNP^1))$
5 Lewis and Soligo assume that the sum of the decomposition results at the sectoral level is representative for the aggregated level :
$$\Delta X = \sum_j \Delta X_j = \sum_j u_j^0(\Delta D_j + \Delta W_j + \Delta E_j) + \sum_j (u_j^1 - u_j^0) Z_j^1$$
6 Chenery, Robinson and Syrquin (1986) , p.134
7 Ibid., p.135

CHAPTER III

DOUBLE DEFLATION OF THE 1990 INPUT-OUTPUT TABLE

3.1 Introduction

The input-output (I-O) data compiled by the State Institute of Statistics (SIS) are tabulated in nominal flows; the entries in the table show nominal payments (in producer's prices) from a column account to a row account while 'real' goods flow from row to column accounts. To ensure comparability over time, it is necessary to derive the corresponding real flows from the nominal flows in the I-O tables.

When the relative prices in an economy change over time , the units of the corresponding real magnitudes are no longer comparable. It is necessary to deflate the I-O tables over time so that the flows are expressed in constant domestic prices. Celasun (1983:134) notes that "The deflation of current price I-O data to constant prices is essential under two sets of circumstances: (i) if there were intersectoral differences in price movements, and/or (ii) if there were intrasectoral differences in the changes of the production, import and export prices over time" .

A brief examination of the Turkish price data for the years 1985 and 1990 reveals that the price increases and the changes in the import tariff rates in the economy were not uniform throughout the sectors . Hence it was necessary to construct price indices and to deflate the data in to constant 1985 prices.

Sections 3.2.1 and 3.2.2 describe the construction of import and production price indices. The import price index PM and the production price index PX are used to construct a composite price index P (where PM, PX and P are vectors comprised of the 1990 price index numbers of the 9 sectors such that 1985=1), which is used to deflate intermediate and final demand. Section 3.3

describes the construction of the composite price index and the double deflation procedure of the 1990 I-O table.

It should be noted at this point that one may check the validity of the deflation of the I-O tables (and hence the adequacy of the constructed price indices), by comparing the GDP growth rate calculated using the value added figures of the constant price (i.e. deflated) I-O tables, with those obtained from official statistics. This check was applied to the double deflation results of the 1990 I-O table, the comparisons are presented in Appendix B.

3.2 The Construction of Domestic Price Indices for Imports and Gross Output

The 1985 and 1990 I-O tables are originally on a 64×64 sector basis. Since price data are not available on such a detailed level, aggregation of the tables was needed. The tables were aggregated to a 9×9 level to facilitate comparability with the Celasun (1983) and Yetkiner (1993) results. The aggregated 1985 and 1990 I-O Tables are presented in Table 3.1. The price indices were calculated for those 9 sectors. The aggregated sectors are demonstrated in Appendix A.

3.2.1 The Imports Price Index

Sectorally arranged import and export price indices are not readily computed and available for the Turkish economy. It is needed to make use of different sources of trade data to construct such indices. In this study, the Summary of Monthly Foreign Trade Statistics of SIS and the Yearbooks of

Table 3.1 1985 and 1990 I-O Tables at 9×9 Aggregated Level

1985 I-O Table at 9×9 Aggregated Level

	I	II	III	IV	V	VI	VII	VIII	IX	INTERM. DEMAND	DOMESTIC FINAL DEMAND	EXPORTS (FOB)	FINAL DEMAND	TOTAL DEMAND	IMPORTS (CIF)	IMPORT TAXES	GROSS OUTPUT	TOTAL SUPPLY
I. AGRICULTURE	953947	17377	1642312	307465	231275	7298	824	4173	43167	3207838	4173244	233509	4406753	7614591	178454	18094	7418043	7614591
II. MINING	12	1874	17203	3849	1659	2200122	2216	190661	12601	2430197	159988	85378	245366	2675563	1897619	13380	764564	2675563
III. FOOD	173567	183	617454	67695	1123	38174	565	7490	200651	1106902	3337258	703418	4040676	5147578	261783	47023	4838772	5147578
IV. TEXTILES AND LEATHER	2414	1725	55522	890046	36747	5624	13988	18819	10446	1035331	1307809	1090205	2398014	3433345	174500	37528	3221317	3433345
V. LIGHT INTERMEDIATES	29152	2810	61979	22617	417989	78392	92189	413083	167714	1285925	768426	114677	883103	2169028	97175	26544	2045309	2169028
VI. BASIC INTERMEDIATES	767685	72260	186710	210597	226824	1782176	909821	2927704	242853	7326630	1816540	819186	2635726	9962356	1724535	573675	7664146	9962356
VII. MACHINERY	46686	17015	27040	19678	12622	45975	746522	255535	112072	1283145	4018894	435774	4454668	5737813	1847383	465688	3424742	5737813
VIII. SOCIAL OVERHEAD	260290	61587	218579	230183	180914	712104	159776	780881	481832	3086146	7250676	1379767	8630443	11716589	257354	0	11459235	11716589
IX. SERVICES	237135	29933	534880	401170	251649	467766	328369	513256	711385	3470543	8103717	1056120	9159837	12630380	272215	532	12357633	12630380
VALUE ADDED (p.p)	4947155	564800	1477093	1068017	684507	2326515	1170472	6347633	10374911	24232657	30936552	5918034	36854586	61087243	6711018	1182464	53193761	61087243

1990 I-O Table at 9×9 Aggregated Level

	I	II	III	IV	V	VI	VII	VIII	IX	INTERM. DEMAND	DOMESTIC FINAL DEMAND	EXPORTS (FOB)	FINAL DEMAND	TOTAL DEMAND	IMPORTS (CIF)	IMPORT TAXES	GROSS OUTPUT	TOTAL SUPPLY
I. AGRICULTURE	14926387	58962	15874331	3600509	2596917	33996	9700	112888	2858555	40072245	56934089	2513039	59447128	99519373	2609823	469059	96440491	99519373
II. MINING	12621	14410	172144	8789	23118	12516106	38458	2881526	117024	15784196	2924366	509924	3434290	19218486	11177151	98752	7942583	19218486
III. FOOD	2062461	3498	7397854	574354	17289	246633	3448	581602	2829845	13716984	33253432	5086312	38339744	52056728	3912944	1419125	46724659	52056728
IV. TEXTILES AND LEATHER	133875	6456	351890	14096561	182318	64251	111430	266556	147936	15361273	20796544	11514481	32311025	47672298	3186720	381881	44103697	47672298
V. LIGHT INTERMEDIATES	440814	32403	744061	249874	6905295	491822	903348	6192968	1951240	17911825	10843903	567725	11411628	29323453	1711621	656307	26955525	29323453
VI. BASIC INTERMEDIATES	5230409	549092	1472457	760496	2647568	19793275	11687327	29409039	4759112	76314775	18590636	6433705	25024341	101339116	20705901	4747803	75885412	101339116
VII. MACHINERY	398991	194587	382551	205792	230331	1019658	9733968	7078173	2948955	22193006	48752900	2595508	51348408	73541414	21629678	5622865	46288871	73541414
VIII. SOCIAL OVERHEAD	2916649	463749	2819906	2534279	3070377	6132337	2580745	10649937	9522220	40690199	108573771	15400129	123973900	164664099	2240327	1049	162422723	164664099
IX. SERVICES	4887179	396065	3064381	6783450	2092174	5031472	3499157	13257873	16864391	55876142	125402871	10192699	135595570	191471712	1881772	0	189589935	191471712
VALUE ADDED (p.p)	65410525	6223361	14445084	15289593	9190138	30555862	17721290	91992161	147590657	297920645	426072512	54813522	480886034	778806679	69055942	13396841	696353896	778806679

Note: The Domestic Final Demand figures are the summations of public and private consumption and investment.

Source : The 1985 and 1990 I-O Tables, SIS.

U.N. International Trade Statistics were used for this purpose. The exports price index PE, was assumed to be equal to the production price index PX. The steps taken to construct the imports price index are described below.

1) For the agriculture, mining, light intermediates, basic intermediates and machinery sectors, the Summary of Monthly Foreign Trade Statistics of SIS for 1985 and 1990 were used. These publications provide trade data by 'major sectors' and by 'commodity groups'. The imported quantities (in tons) as well as the corresponding payments (in 1000$) are given for these two categories in different tables[1]. The payments data were divided by the corresponding quantity data to obtain unit $ prices for all these sectors. The calculations are presented in Table 3.2.

Table 3.2 Calculation of Unit $ Prices for Agriculture, Mining, Light Intermediates, Basic Intermediates and Machinery Sectors

	1985			1990		
	Quantity	Value	Unit Price	Quantity	Value	Unit Price
AGRICULTURE	1253155	375288	299.5	3911330	1322944	338.2
MINING	20737659	3626317	174.9	28265650	3989317	141.1
LIGHT INTERMEDIATES	31882378	7809565	244.9	45624719	13488981	295.6
BASIC INTERMEDIATES	31882378	7809565	244.9	45624719	13488981	295.6
MACHINERY	553931	2655530	4794	439931	5068891	4800.8

Note: Quantities are measured in tons, values in 000$, and unit prices in $.
Source : Summary of Monthly Trade Statistics, 1985,1990, SIS.

2) For the textiles and leather and food sectors, an approach similar to those used by Celasun (1983) and Yetkiner (1993) was used. For each of these sectors, certain commodities whose data are available in the Yearbooks of U.N. International Trade Statistics (Turkey) were selected according to their relative weights (importance) in the total imports of that sector. The unit $ price values for the commodities were computed again by dividing the payments (in 1000$) values to the quantities (in tons). Then a weighted average of the commodity

prices were computed for each sector. The weight for a given commodity was the value of payment for that commodity divided by the total payments to all the selected commodities in the sector[2]. These weighted averages for the textiles and leather, food sectors were used as the unit $ prices for those sectors. It was assumed that the price movements of the most important commodities in a sector is representative of the movement of the price attributable to that sector. The calculations are presented in Table 3.3.

Table 3.3 Unit $ price Calculations for Food and Textiles Sectors

	1985				1990			
	Quantity	Value	Unit Price	Weighted Unit Value	Quantity	Value	Unit Price	Weighted Unit Value
Food								
Soya Bean Oil	106398	66749	627.3	162.9	124345	58069	466.9	81.3
Sunflower Seed Oil	72084	47625	660.7	122.4	213522	107172	501.9	161.2
Fixed Veg. Oils,soft	210002	142734	679.7	377.3	339773	168388	495.6	250.1
Average Unit Price			662.6				492.5	
Textiles and Leather								
Textile Yarn	44821	137176	3060.5		95259	327843	3441.6	
Average Unit Price			3060.5				3441.6	

Source : The calculations are based on the Yearbooks of U.N. International Trade Statistics (Turkey) 1985 ,1990.

3) As for the remaining two sectors; social overhead and services, arithmetic averages of the textiles and leather, food, light intermediates and basic intermediates sectors were used assuming that their prices followed the trends in the non-food and non-petroleum sectors.

4) These unit $ prices for the 9 sectors were converted to Turkish Liras by multiplying them by the TL/$ exchange rates of the benchmark years[3], and the unit prices in TL were obtained.

5) The import price indices are used for the deflation of the *total imports*, (imports plus the import tax payment values). Hence our import price indices should capture the variations in the import tax rates as well as the variations of the 'world prices' of imports. Following Celasun (1995), PM_{it}, denotes the unit TL tax inclusive import price :

(3.1) $$PM_{it} = \pi_{it} ER_t (1+tm_{it})$$

where π_{it} = world $ price of sector i in year t

ER_t= TL/$ exchange rate in year t

tm_{it} = import tax rate for sector i in year t

i=1..9 , t = 1,2

The realized import tax rates for any sector i is calculated by dividing the ith row entry of the import taxes column of the I-O table by the ith row entry of the imports column. These import tax rates computed for each year were multiplied by the unit TL price for each sector, and the final import tax inclusive unit TL prices were found for both years 1985 and 1990[5]. The computed import tax rates and tax inclusive unit TL prices are presented in Table 3.4.

The import price index is constructed by taking 1985 as the base year, that is by letting the import tax inclusive unit TL price for 1985 for all the 9 sectors to equal 1, and dividing the 1990 import tax inclusive unit TL prices by those of 1985. The resulting import deflator (PM) for 1990 are given in Table 3.5.

Table 3.4 Tax Inclusive Unit TL Import Prices

	1985			1990		
	Unit TL Price	Import tax rate	Import tax incl. Unit TL Price	Unit TL Price	Import tax rate	Import tax incl. Unit TL Price
Agriculture	156325.7	0.1014	172176.0	882316.7	0.1797	1040893.9
Mining	91280.2	0.0071	91923.8	368168.9	0.0088	371421.7
Food	345864.9	0.1796	407991.2	1285122.8	0.3627	1751204.1
Textiles and Leather	1597596.5	0.2151	1941175.9	8977747.5	0.1198	10053597.0
Light Intermediates	127863.5	0.2732	162790.3	771234.5	0.3834	1066957.9
Basic Intermediates	127863.5	0.3327	170397.9	771234.5	0.2293	948076.3
Machinery	2502453.6	0.2521	3133271.8	12523468.7	0.2600	15779077.7
Social Overhead	1088944.3	0.0000	1088944.3	5760921.3	0.0005	5763618.7
Services	1088944.3	0.0020	1091072.5	5760921.3	0.0000	5760921.3

Source: Unit TL prices were calculated as described in step 4. Import tax rates were calculated using the 1985 and 1990 I-O Tables, SIS. Tax inclusive unit TL prices were calculated as described in step 5.

Table 3.5 The Domestic Import Price Index for 1990 (1985=1)

SECTORS	IMPORT DEFLATOR(PM)
AGRICULTURE	6.04
MINING	4.04
FOOD	4.29
TEXTILES AND LEATHER	5.17
LIGHT INTERMEDIATES	6.55
BASIC INTERMEDIATES	5.55
MACHINERY	5.03
SOCIAL OVERHEAD	5.29
SERVICES	5.28

Source : The deflators are calculated using U.N. International Trade Statistics and Summary of Monthly Foreign Trade Statistics, SIS.

The exchange rate index for 1990 with 1985=1 equals 5. Hence it can be seen from Table 3.5 that the relative domestic import prices for the food and mining sectors declined between 1985 and 1990. The sharp decline in the mining sector price was due to the fall of the oil price in the world between 1985 and 1990.

3.2.2 The Production Price Index

The production price index PX was used to deflate gross output (domestic production) and the exports. Two different indices were constructed as the production price index. The first one was based on the Wholesale Price Index (1981=1) of SIS. A composite price index was computed (the procedure is described in section 3.3) and the 1990 I-O table was deflated using this WPI based index . The deflated 1990 I-O table (in 1985 prices) was used to calculate the GDP growth rate between 1985 and 1990. Since the calculated GDP growth rate (in 1985 prices) exceeded the official one substantially, the production price index based on the SIS WPI was not used.

The second production price index was constructed using the implicit GDP deflators which were calculated using the constant and current price New SIS series for Gross Domestic Product. The procedure for the construction of the price indices is shown in Table 3.6. The average of the agriculture and manufacturing prices were used for the food sector, whereas the manufacturing price index was used for deflating textiles and leather, light intermediates, basic intermediates and machinery sectors. The deflation based on the GDP deflator based price index was also checked for validity and proved to be acceptable, as clarified in Appendix B.

Table 3.6 Construction of Production Price Index

	GDP-90 1990 PRICES	GDP-90 1987 PRICES	(1987=1) GDP 1990 DEFLATOR	GDP-85 1985 PRICES	GDP-85 1987 PRICES	(1987=1) GDP 1985 DEFLATOR	SUBSECTOR INDEX (1985=1)	SECTOR INDEX (1985=1)
AGRICULTURE	68692041	14176792	484.54	6910473	12669498	54.55	8.88	8.88
MINING	6269186	1549911	404.48	560544	1258270	44.55	9.07	9.07
MANUFACTURING	86307440	18729069	460.82	6406649	13418116	47.75	9.65	9.65
SOCIAL OVERHEAD SUBSECTORS								
Electricity, Gas, Water	7744703	2023154	382.80	636292	1232450	51.63	7.41	
Construction	24746455	5411439	457.30	2051534	4272747	48.01	9.52	
Transportation,Communication	46490154	10123335	459.24	4460728	7651559	58.30	7.88	8.31
SERVICES SUBSECTORS								
Wholesale and Retail Trade	64800655	14421262	449.34	5830272	10261613	56.81	7.90	
Restaurants, Hotels	10111359	2447018	413.21	860232	1642207	52.39	7.88	
Financial Inst., Insurance	12659531	2496156	507.16	779850	2119580	36.80	13.78	
Personal and Professional Services	14415380	1926241	748.37	826775	1493330	55.37	13.52	
Public Services	32525313	4018923	809.30	1787838	3700082	48.32	16.75	
Ownership of Dwellings	13218396	4615994	286.36	2523679	4134030	61.05	4.70	9.25

Note : Weighted averages of subsectors are used for Social Overhead and Services sectors.
Source: The New Gross National Product Series , SIS.

3.3 The Construction of the Composite Price Index and the Deflation of the 1990 I-O Table

After having obtained the domestic price indices for imports and production, PM and PX respectively, the composite price index P which will be used for deflating total supply (and total demand) will be constructed, following the Celasun (1995) approach. In order to explain this procedure, we need to introduce some new notation. All the variables below are in constant 1985 prices.

a_{ijt} = the ij th entry of the I-O coefficients matrix of the t th year

X_{ijt} = the ij th entry of the I-O table of the t th year

X_{it} = the gross output of the i th sector in year t

D_{it} = the domestic final demand in the i th sector in year t

E_{it} = exports of the i th sector in year t

M_{it} = imports of the i th sector in year t

TM_{it} = import taxes of the i th sector in year t

Q_{it} = total domestic demand in the i th sector in year t

W_{it} = total intermediate demand for the i th sector in year t

MS_{it} = total imports ($MS_{it} = M_{it} + TM_{it}$)

where t =1,2 and i,j =1,2,..9. PX_{it}, PE_{it}, PM_{it} are the prices of X_{it}, E_{it}, MS_{it} respectively, where PE_{it} is assumed to be equal to PX_{it}. Note that :

(3.2) $$a_{ijt} = X_{ijt} / X_{jt}$$

(3.3) $$W_{it} = \sum_j a_{ijt} X_{jt} = \sum_j X_{ijt}$$

(3.4) $$Q_{it} = (X_{it} - E_{it}) + M_{it} + TM_{it} \text{ (= total supply net of exports)}$$

3.3.1 Construction of the Composite Price Index

We can write our *constant price* material balance equation as follows :

$$(3.5) \qquad \sum_j a_{ijt}X_{jt} + D_{it} + E_{it} - M_{it} - TM_{it} = X_{it}$$

Letting (*) denote the *current price* values, the current price material balance can be written as :

$$(3.6) \qquad \sum_j a_{ijt}^{*}X_{jt}^{*} + D_{it}^{*} + E_{it}^{*} - M_{it}^{*} - TM_{it}^{*} = X_{it}^{*}$$

where

$$(3.7) \qquad MS_{it}^{*} = M_{it}^{*} + TM_{it}^{*} = PM_{it}\, MS_{it}$$

$$(3.8) \qquad E_{it}^{*} = PE_{it}E_{it}$$

$$(3.9) \qquad X_{it}^{*} = PX_{it}X_{it}$$

$$(3.10) \qquad Q_{it}^{*} = P_{it}Q_{it}$$

P_{it} = price of Q_{it} (the composite price for sector i in year t)

The price indices PM_{it}, PX_{it} and hence PE_{it} (where $PM_{it}=PX_{it}=PE_{it}=1$ for t=1) have already been computed. The first step now is to estimate the composite price P_{it}, i=1,..9 where P_{it} =1 for t=2. This can be done by dividing the total domestic demand in 1990; Q_{i2}^{*}, by Q_{i2}, the total domestic demand in 1990 in *constant 1985 prices* .We first determine Q_{i2} as follows:

$$(3.11) \qquad Q_{i2} = (X_{i2}^{*} / PX_{i2}) - (E_{i2}^{*} / PE_{i2}) + (MS_{i2}^{*} / PM_{i2})$$

Now P_{i2} can be obtained as:

$$(3.12) \qquad P_{i2} = Q_{i2}^{*} / Q_{i2}$$

The Composite Price Index is presented in Table 3.7

Table 3.7 The Composite Price Index for 1990 (1985=1)

SECTORS	The Composite Price Index (P)
AGRICULTURE	8.75
MINING	5.18
FOOD	8.21
TEXTILES AND LEATHER	8.89
LIGHT INTERMEDIATES	9.29
BASIC INTERMEDIATES	8.06
MACHINERY	7.14
SOCIAL OVERHEAD	8.24
SERVICES	9.14

Source : The calculations are based on the 1985 and 1990 I-O Tables (SIS) and the price indices PM and PX, calculated in sections 3.2.1 and 3.2.2

3.3.2 The Double Deflation Procedure

Now as we have obtained the composite price index P, we may deflate the current 1990 I-O table in to 1985 constant prices.

- The technological (I-O) coefficients are deflated as follows :

(3.13) $$a_{ij2} = a_{ij2}^{*} \, (PX_{j2} / P_{i2})$$

recalling that $a_{ijt} = (X_{ijt}^{*}/P_{it})/(X_{jt}^{*}/PX_{jt})$ for t=2.

- The domestic final demand D_{i2} , exports E_{i2} and MS_{i2} in 1985 prices can be found by deflating the corresponding values in current 1990 prices with their 1990 price index numbers:

(3.14) $$D_{i2} = D_{i2}^{*} / P_{i2}$$

(3.15) $E_{i2} = E_{i2}^{*} / PX_{i2}$

(3.16) $MS_{i2} = MS_{i2}^{*} / PM_{i2}$

- X_{it} can be determined in matrix form[5]:

(3.17) $X_t = [I-A_t]^{-1}[D_t+E_t-MS_t]$

The 1990 I-O table in 1985 producer's prices is thus obtained and is displayed in Table 3.8. The 1990 GDP in 1985 producer's prices can now be determined as[6] :

(3.18) $GDP_2 = \sum_j(X_{j2}(1-\sum_i a_{ij2})) = \sum_j(D_{j2}+E_{j2}-MS_{j2})$

where $(1-\sum_i a_{ij2})$ equals the value added of sector j (including indirect taxes on production and import taxes).

The comparison of the GDP growth rate (in 1985 producer's prices) computed using the deflated 1990 I-O table and equation 3.18, and those given in the official statistics is presented in Appendix B.

Table 3.8 Double Deflated 1990 I-O Table Aggregated at 9×9 Level (In 1985 Prices)

	I	II	III	IV	V	VI	VII	VIII	IX	INTERM. DEMAND	DOMESTIC FINAL DEMAND	EXPORTS (FOB)	FINAL DEMAND	TOTAL DEMAND	IMPORTS (CIF)	IMPORT TAXES	GROSS OUTPUT	TOTAL SUPPLY
I. AGRICULTURE	0.1571	0.0077	0.3448	0.0900	0.1062	0.0005	0.0002	0.0007	0.0159	4578112	6504518	282891	6787409	11365521	431695	77588	10856238	11365521
II. MINING	0.0002	0.0032	0.0063	0.0004	0.0016	0.3071	0.0015	0.0284	0.0011	3045125	564176	56161	620337	3665461	2766253	24440	874767	3665461
III. FOOD	0.0231	0.0005	0.1712	0.0153	0.0008	0.0038	0.0001	0.0036	0.0168	1670078	4048691	572562	4621253	6291331	757018	274551	5259762	6291331
IV. TEXTILES AND LEATHER	0.0014	0.0008	0.0075	0.3469	0.0073	0.0009	0.0026	0.0015	0.0008	1727248	2338400	1193031	3531430	5258679	615301	73734	4569643	5258679
V. LIGHT INTERMEDIATES	0.0044	0.0040	0.0152	0.0059	0.2661	0.0067	0.0203	0.0341	0.0102	1928087	1167273	58823	1226096	3154183	261149	100136	2792898	3154183
VI. BASIC INTERMEDIATES	0.0598	0.0779	0.0347	0.0206	0.1176	0.3122	0.3022	0.1866	0.0288	9465053	2305731	666605	2972336	12437389	3721476	853323	7862590	12437389
VII. MACHINERY	0.0051	0.0312	0.0102	0.0063	0.0116	0.0182	0.2843	0.0507	0.0202	3108983	6829717	268924	7098641	10207625	4295033	1116540	4796052	10207625
VIII. SOCIAL OVERHEAD	0.0326	0.0644	0.0651	0.0673	0.1334	0.0947	0.0653	0.0661	0.0564	4939144	13179131	1853472	15032602	19971746	423274	198	19548273	19971746
IX. SERVICES	0.0491	0.0493	0.0635	0.1618	0.0816	0.0697	0.0795	0.0739	0.0896	6089149	13665881	1102160	14768041	20857189	356394	0	20500796	20857189
VALUE ADDED (p.p)	0.6672	0.7611	0.2814	0.2855	0.2737	0.1861	0.2439	0.5543	0.7601	36550979	50603517	6054629	56658146	93209125	13627592	2520511	77061021	93209125

Note: The first nine columns are comprised of the A matrix, and the value added rates $\sum_j (1-a_{ij})$
Source: Numerical results of the double deflation.

NOTES

1 While agriculture and mining are given as 'major sectors', machinery is given under 'commodity groups' : investment goods. The *Raw Materials* entry of the 'commodity groups' table was used for light and basic intermediates.

2 Celasun (1983) and Yetkiner (1993) use a more refined treatment of the weights or *shares* . They calculate the geometric averages of the commodity weights for the benchmark years and use those average shares when calculating the unit prices.

3 The average TL/$ exchange rates for the years 1985 and 1990 were found from the U.N. International Financial Statistics,1990. The rate was 522.0 TL/$ for 1985 and 2,608.6 TL/$ for 1990.

4 Letting M_{it} and TM_{it} denote the i th sector entry of the import and import tax columns of the I-O table of year t, the import tax rates are found as $tm_{it}= TM_{it}/ M_{it}$. Then the *import tax inclusive* import prices are calculated by multiplying the unit TL prices found in step 4 by $(1+ tm_{it})$.

5 Gross output X_{i2} can also be determined as $X_{i2} = X_{i2}^{*} / PX_{i2}$

6 The GDP in *market prices* is :

$$GDP_2 = \sum_j(X_{j2}(1-\sum_i a_{ij2})) + \sum_j TM_{j2} = \sum_j(D_{j2}+E_{j2}-M_{j2})$$

CHAPTER IV

DECOMPOSITION RESULTS AND THE SOURCES OF IMPORT GROWTH ANALYSIS

4.1 Introduction

In this chapter, the 1985 I-O table and the double deflated 1990 I-O table in constant 1985 prices are used to decompose the import growth between 1985 and 1990 into four sources: domestic demand expansion, export expansion, import substitution, and technological change. It is seen that the results differ widely from those pertaining to the 1979-85 period. While domestic demand expansion became the most important factor, export expansion did not contribute to the growth of imports positively between 1985 and 1990.

The decomposition results are stated in section 4.2. In section 4.3 an overview of the economic conditions in Turkey between 1985 and 1990 is presented and the results of the analysis are evaluated in this context. Section 4.4 concludes.

4.2 Sources of Import Growth Between 1985 and 1990

The change in imports in 1985-90 (in constant 1985 prices) were decomposed following the Syrquin (1976) first difference approach, as presesented in Celasun (1983:146-7). The equations used and the derivations are provided in Appendix C.

The total contribution of the expansion of domestic demand (DDE) was 60.95 percent between 1985 and 1990. The contributions of export expansion, import substitution and technological change were -0.51, 29.06 and 10.49 percent respectively. The results are tabulated in Table 4.1, together with the

TABLE 4.1 Sources of Import Growth (Total Method)

	DDE			EE			IS			TC		
	1963-73	1979-85	1985-90	1963-73	1979-85	1985-90	1963-73	1979-85	1985-90	1963-73	1979-85	1985-90
I.AGRICULTURE	24.2	3.3	36.3	2.8	4.8	-0.53	-107.5	93.4	57.11	-19.6	-1.5	7.12
II. MINING	49.0	20.3	122.29	5.7	37.6	-2.92	8.9	16.7	-44.05	36.4	25.4	24.67
III. FOOD	39.1	8.9	15.14	2.2	2.6	-0.36	-151.0	86.3	81.17	9.8	2.2	4.05
IV. TEXTILES AND LEATHER	215.2	-24.2	36.16	9.4	10.9	1.30	-128.2	108.3	54.78	3.6	4.9	7.75
V. LIGHT INTERMEDIATES		27.6	37.56		34.0	-0.16		55.2	58.89		-16.9	3.71
Wood Products	47.5			0.7			-163.8			15.6		
Paper Products	3343.2			107.8			-3692.9			342.0		
Rubber and Plastics	67.2			2.4			-183.5			13.9		
VI. BASIC INTERMEDIATES		72.2	55.56		50.5	-0.04		-8.9	47.19		-13.9	-2.71
Chemicals	61.4			2.2			9.8			26.6		
Petr. And Coal Production	87.6			7.8			-36.2			40.8		
Non-metallic Mineral Production	196.2			2.4			-131.4			32.7		
Basic Metals	57.7			-171.8			93					
VII. MACHINERY		65.5	58.64		8.7	-0.52		40.3	23.09		-14.6	18.79
Metal Products	108.7			1.5			2.6			-12.8		
Machinery	141.3			0.7			-24.0			-18.1		
Transport Equipment	153.4			3.8			-86.8			29.6		
VIII. SOCIAL OVERHEAD	321.1	19.8	108.74	10.9	16.3	0.05	-297.2	73.0	-18.70	65.1	-1.0	9.91
IX. SERVICES	175.0	15.6	166.58	6.8	5.7	0.09	-120.7	78.0	-94.45	38.9	0.7	27.78
X. TOTAL III -VII	104.1	29.9	50.91	2.3	19.4	-0.20	-18.6	54.5	40.81	12.3	-3.9	8.48
XI. TOTAL I.- IX	107.4	24.6	60.95	3.2	12.0	-0.51	-26.5	63.4	29.06	16.0	-0.02	10.49

Note : All figures are arithmetical averages of Paasche and Laspeyres indices and are in percentage terms. The estimates for the DDE, EE, IS and TC contributions add up to 100 for each sector (row).

Sources : 1963-73 figures are taken from Celasun (1983), 1979-85 figures are taken from Yetkiner (1993). 1985-1990 figures are results of the decomposition analysis (total method).

estimates for the periods 1963-73 (Celasun,1983) and 1979-85 (Yetkiner, 1993), to facilitate comparability.

The growth of manufacturing imports (i.e. food, textiles and leather,light intermediates, basic intermediates and machinery) account for 82 percent of the total growth of imports in 1985-90. Among all the manufacturing sectors, the growth of imports are highest in the basic intermediates and machinery sectors; growth of imports in these two sectors account for 28.8 and 36.6 percent of the overall increase in imports respectively.

Domestic demand expansion was the most important source of import growth in the 1963-73 period, but lost its relative prominence between 1979 and 1985. In the 1985-90 period however, it became the most important contributor again. An important shift is seen in the mining sector. The contribution of DDE was 20.3 percent in the 1979-85 period, but it became 122.3 during the 1985-90 period, due to the drastic increase of demand in the mining sector. DDE became a positively contributing factor in the textiles and leather sector between 1985 and 1990, probably because of an increase in the disposable income of the consumers during that period compared to the previous one. The weight of DDE is very large in the social overhead and services sectors as well; 108.7 and 166.6 percent of the increase in imports in these sectors were attributable to DDE.

The 1980-1987 period was characterized by a strong export growth. The contribution of EE to import growth was 12 percent between 1979 and 1985, showing increased import intensity in intermediates for exported goods. The positive trend in EE did not extend to the 1985-90 period. The change in the economic conditions, as explained in section 4.3, led to a decline in exports especially after 1988. The largest positive contribution of EE was in the textiles and leather sector. Tariff concessions on imported intermediates for the exported goods led to an increase in imported inputs during that period, but the further increase in imports between 1985 and 1990 did not have much to do with export growth.

IS became a positively contributing factor after the import substitution policies were abandoned in 1979. The contribution of IS was most important after the change of policy; in the 1979-85 period it accounted for 63.4 percent of the total growth of imports. IS continued to be an important factor in the 1985-90 period as well. The contribution of IS in the basic intermediates sector was negative in 1979-85, but increased substantially to 47.2 percent afterwards. The weight of IS is as high as 40.8 percent for the overall manufacturing sector between 1985 and 1990, showing that import penetration continued to be an important factor in the later stages of trade liberalization.

Technological change was an insignificant source of import growth between 1979 and 1985. The contribution of TC became quite significant during 1985-90. The contribution of TC stayed approximately the same for mining, food and textiles and leathers sectors, but increased in all the remaining sectors. The increases are particularly in agriculture, machinery and the non-tradeable sectors. The technological changes in those sectors were in a manner that contributed to the growth of imports.

4.3 An Overview of the Turkish Economy in 1985-90

The 1978-1980 debt crisis marked the end of the inward orientation of the Turkish economy and hence the import substitution motive in trade regimes. The 1980-83 period under military rule was characterized by economic stabilization and trade liberalization at the same time. Real exchange rate depreciation and export promoting policies led to strong export growth. Restrictive wage policies enhanced saving mainly in the public sector, curbed domestic absorption, and hence helped promoting export expansion. The real depreciation of the TL and the repression of real wages in the Turkish economy continued during the 1984-87 period of civilian administration, and supported the trade reforms of the period.

The trade policies implemented by Turkey were liberalized substantially after 1980. Nominal and effective protection rates, and the variance of

protection rates among industries were reduced, quantity restrictions on imported goods were abandoned, subsidies were reduced after 1985 and the anti-export bias in the trade regime was removed. (Togan, 1993: 285) Export promotion and realistic exchange rates were two important features of the post 1980 adjustment program. The TL was devaluated 48.6 percent against the US$ in 1980. The average annual rate of real depreciation was about 4 percent between 1981 and 1987, showing that the policy of real exhange rate depreciation was retained during that period. This led to a strong export growth during the same period, and also kept the growth of imports under control.

The growth of exports improved the balance of payments and compensated for the reduced domestic demand after the 1978-80 debt crisis. Incentives to promote exports were tax rebates, credit subsidies, foreign exchange allocations that allowed for duty-free imports of intermediates and raw materials. (Baysan and Blitzer,1990: 13)

Imports were liberalized gradually, mainly after 1983, when almost all consumer goods were liberalized. Yet the tariff rates on consumer goods were increased. The reverse applied to capital goods. As for intermediates, both measures of protection were eased. Direct import controls were removed in 1984, and the "positive list" for imports was replaced with a "negative list". In 1985, the list of prohibited imports contained only three items. The nominal tariff rates were lowered substantially in 1989. The liberalization process went on until 1990, when all quantity and price restrictions on imports were removed.

The 1989-90 period was characterized by capital account liberalization; capital flows were liberalized in the external accounts. This reversed the major exchange rate trends that prevailed in the Turkish economy between 1981 and 1987. The cumulative appreciation of the real exchange rate amounted to no less than 20 percent during 1988-89. The liberalization of capital flows increased the real interest rates as well. The 1989 tariff reductions combined with the currency appreciation led to an import boom and deteriorated the trade balance in 1990[1].

Real wage repression, a politically unsustainable aspect of macroeconomic adjustment and stabilization in 1981-87, could not be sustained after the 1987 elections. The real wage recovery was rapid, the 1988-89 period saw a sharp increase in the real wage. The wage increase between 1988 and 1989 was 129 percent in the private, and 188 percent in the public sector. The increase in the public sector wage bill was a further strain on the public sector, which was already burdened by the debt repayments after 1985. Celasun and Arslan (1992) note that the domestic demand growth following the wage recovery was an important factor in the import explosion of 1990.

In 1986, the oil price decreased substantially, which had implications for both the imports and exports of Turkey. Upon the fall in the oil price, exports declined by 8 percent in a year, due to the contraction of demand by oil-exporting Iraq and Iran, the major purchasers of Turkish exports. At the same time, imports decreased by 5 percent, due to the fall in the dollar value of the oil bill. However, this enabled an increase of imports in other categories, in the following years.

The main trends in the Turkish economy were not uniform throughout 1985-90. The 1988 reversal in the real exchange rate and real wage trends combined with lowered tariffs promoted strong import penetration . Concurrent expansion of aggregate domestic demand explain the substantial real growth of imports between the benchmark years of our study 1985 and 1990. Domestic demand expansion which accounts for about 60 percent of the growth according to our analysis, was a major drive in the import boom particularly after 1988. The approximately 30 percent attributed to IS shows the negative import substitution response to liberalization and declined import prices . The policy changes after 1988 which were in favor of import growth may be considered to be responsible for generating the reverse effects on exports. The real decline of exports during 1985-90 did not contribute to the growth of imports positively. On the contrary, imported intermediates for exported goods declined, following the trend in exports. Changes in the interindustry flows contributed significantly to the import growth as well. The 10 percent

contribution of technological change shows that the weight of imports in overall intermediates increased. The sectoral figures for the change in domestic demand, exports, import ratios and the I-O (technological) coefficients are given in Appendix D.

4.4 Conclusion

The 1985-90 period saw a great deal of policy reversals and fluctuations in relative prices in the Turkish economy. Against this background, imports grew substantially in real terms between 1985 and 1990, marking the start of the deterioration of the trade balance, a process which continued well into the 1990s. The results of the decomposition analysis of the sources of import growth in 1985-90 are consistent with the broad conditions in the Turkish economy during the same period.

Export expansion, the success story of Turkish economic performance in the first half of the 80s, had gone through structural change during 1979-85, and become an important causal factor in import growth during that period[2]. Our results show that the rather modest expansion of exports in most sectors in 1985-90 was an insignificant source of import growth.

Domestic demand expansion, a major cause of output growth after 1988, was an important source of import growth between 1985 and 1990. Especially in those sectors with greatest shares of import growth; mining,basic intermediates and machinery (these sectors accounted for 11, 29 and 37 percent of the total growth of real imports in 1985-90 respectively) the domestic demand effect was strongest. DDE accounted for 122, 55 and 58 percent of the growth of imports in these sectors.

Import substitution was a positively conributing factor in 1985-90. The contribution of IS is highest (81 percent) in the food industry, which represented 8 percent of the growth of imports. The result reveals that import penetration maintained its importance in the later stages of trade liberalization, as it did (to a greater extent) in the earlier period of 1980-85.

Changes in the technological coefficients regained importance as a source of import growth and explained 10 percent of the change in imports. This shows that technological change took place in a manner that increased the weight of imports in intermediate flows. The contribution of TC is most significant in the mining and machinery sectors.

NOTES

1 The reductions in the tariff rates after 1988 were part of a program aiming to fight inflation. (Uygur,1992:20)

2 Yetkiner (1993:35).

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APPENDIX A
AGGREGATED SECTORS

I.AGRICULTURE	II.MINING	III.FOOD
1.AGRICULTURE 2.ANIMAL HUSBANDRY(LIVESTOCK) 3.FORESTRY 4.FISHERIES	5.COAL MINING 6.CRUDE PETROL. AND NAT.GAS PRODUCTS 7.IRON ORE MINING 8.NON-FERROUS ORE MINING 9.NON-METTALIC MINERAL MINING 10.STONE QUARRYING	11.SLAUGHTER.,PREP.AND PRESER.MEAT 12.CAN. AND PRESER. OF FRUITS AND VEG. 13.MAN. OF VEG. AND ANIMAL OIL.AND FAT. 14.GRAIN MILL PRODUCTS 15.SUGAR 16.MANUFACTURE OF OTHER FOOD PROD. 17.ALCHOLIC BEVERAGES 18.SOFT DRINKS AND CARBON. WATER IND. 19.TOBACCO MANUFACTURES
IV.TEXTILES AND LEATHER	**V.LIGHT INTERMEDIATES**	**VI.BASIC INTERMEDIATES**
20.GINNING 21.MANUF.OF TEXTILES(EXCL.GINNING) 22.MANUFACTURE OF WEARING APPAREL 23.MANUF. OF LEATHER AND FUR PROD. 24.MANUFACTURE OF FOOTWEAR	25.MAN. OF WOOD AND WOOD PROD. 26.MAN. OF WOOD FURNITURE AND FIXTURES 27.MAN. OF PAPER AND PAPER PRODUCTS 28.PRINTING,PUBLISHING AND ALLIED INDUST. 34.MANUFACTURE OF RUBBER PRODUCTS 35.MANUFACTURE OF PLASTIC PRODUCTS	29.MANUFACTURE OF FERTILIZERS 30.MANUF. OF DRUGS AND MADICINES 31.MANUF. OF OTHER CHEMICAL PROD. 32.PETROLEUM REFINERIES 33.MAN. OF PETR. AND COAL PRODUCTS 36.MAN. OF GLASS AND GLASS PRODUCTS 37.MANUFACTURE OF CEMENT 38.MAN. OF OTH.NON-METALLIC MINERAL P. 39.MANUFACTURE OF IRON AND STEEL 40.MANUF. OF NON-FERROUS METAL
VII.MACHINERY	**VIII.SOCIAL OVERHEAD**	**IX.SERVICES**
41.MAN. OF FABRICATED METAL PROD. 42.MAN. OF MACHIN. EXCEPT ELECTRICAL 43.MAN. OF AGRICULTURAL MACH. AND EQ. 44.MANUF. OF ELECTRICAL MACHINERY 45.MAN. OF SHIPBUILDING AND REPAIRING 46.MANUF. OF RAILROAD EQUIPMENT 47.MAN. OF LAND TRANSP. VEHIC. AND EQ. 48.MAN. OF OTHER TRANSPORT EQUIP. 49.OTHER MANUF. INDUSTRIES	50.ELECTRICITY 51.GAS MANUF. AND WATERWORKS 52.BUILDING CONSTRUCTION 53.OTHER CONSTRUCTION 56.RAILWAY TRANSPORT 57.OTHER LAND TRANSPORT 58.WATER TRANSPORT 59.AIR TRANSPORT 60.COMMUNICATION	54.WHOLESALE AND RETAIL TRADE 55.RESTAURANTS AND HOTELS 61.FINANCIAL INSTIT. AND INSURANCE 62.PERSONAL AND PROFESSIONAL SERV. 63.PUBLIC SERVICES 64.OWNERSHIP OF DWELLINGS

Source: Celasun (1983)

APPENDIX B

COMPARISON OF THE GDP GROWTH RATE CALCULATED USING THE 1985 AND 1990 I-O TABLES AND THOSE GIVEN IN THE NATIONAL ACCOUNTS

It is possible to calculate the *real* GDP growth rate between 1985 and 1990 as described in section 3.3.2, using the deflated 1985 and 1990 I-O tables. It can be seen from Table C.3 that the real growth rate calculated in this manner exceeds those calculated using the new and old GDP series of SIS and SPO, respectively. The nominal GDP growth rate calculated using the 1985 and 1990 I-O tables exceeds those that are estimated using the National Accounts figures as well. This is due to the fact that the 1985 I-O table was compiled using the weights and activities pertaining to the old GNP series, whereas the 1990 table was compiled using the new series weights and activities. Since the new series GDP figures exceed those of the old series substantially, so does the GDP growth rates (real and nominal) calculated using the 1985 and 1990 I-O tables. The GDP growth between 1985 and 1990 as derived from the I-O tables includes the gap between the old and new series data, which explains why it is larger than the National Accounts figures. As a result, the deflation of the 1990 I-O table seems adequate.

Table C.1: Variant Estimates for GDP in the National Accounts and I-O Tables

	1985 (1)	1990 (2)	(1)/(2)
A. Nominal GDP (market prices, trillion TL)			
1. National Accounts			
Old series	27.8	287.3	10.3
New series	35.4	397.2	11.2
2. I-O Tables	30.1	411.8	13.7
B. Real GDP Index (1985=100)			
1. National Accounts			
Old series	100	134	1.34
New series	100	132	1.32
2. Deflated I-O Tables[1]	100	139	1.39

1 The author's estimates.

Source: State Institute of Statistics and State Planning Organization for new and old series data respectively.

APPENDIX C

FIRST DIFFERENCE DECOMPOSITION OF
GROSS OUTPUT AND IMPORTS
- TOTAL METHOD-

In order to derive the decomposition of the growth of domestic output and the growth of imports, we start with the following definitions, formulated by Syrquin (1976):

(C.1) $m_{it} = M_{it}/(D_{it}+W_{it})$

(C.2) $u_{it} = (X_{it}-E_{it})/(D_{it}+W_{it})$

where $W_t = A_t X_t$

A_t= input output coefficients matrix for year t

X_t= gross output vector in year t

M_t= total imports vector in year t (imports+import taxes)

D_t = domestic final demand vector in year t

W_t = intermediate demand vector in year t

E_t = exports vector in year t

m_{it}= import ratio of sector i in year t

u_{it}= (1-m_{it}) = domestic use ratio of sector i in year t

$m\hat{}_t$ = diagonalized vector of m_{it}s

$\hat{u}_t$ = diagonalized vector of u_{it}s

It is possible to decompose the growth of gross output and imports by using either the terminal year volume weights and base year structural coefficients (Laspeyres version), or by using the base year volume weights and terminal year structural coefficients (Paasche version). Both versions are derived below, and the arithmetical averages of the results of the two decomposition formulas were calculated for the decomposition of import growth between 1985 and 1990.

Decomposition of the Growth of Gross Output:

From equation C.2, we can derive Xit as follows:

(C.3) $X_2 = \hat{u}_2 A_2 X_2 + \hat{u}_2 D_2 + E_2$

(C.4) $X_1 = \hat{u}_1 A_1 X_1 + \hat{u}_1 D_1 + E_1$

(C.5) $X_2 - X_1 = \hat{u}_2 A_2 X_2 - \hat{u}_1 A_1 X_1 + \hat{u}_2 D_2 - \hat{u}_1 D_1 + E_2 - E_1$

Paasche Version:

(C.6) $\Delta X = \hat{u}_2 A_2 X_2 - \hat{u}_1 A_1 X_1 + \hat{u}_2 D_2 - \hat{u}_1 D_1 + \Delta E$

(C.7) $\Delta X = \hat{u}_2 A_2 \Delta X + \hat{u}_2 A_2 X_1 - \hat{u}_1 A_1 X_1 + \hat{u}_2 \Delta D + \hat{u}_2 D_1 - \hat{u}_1 D_1 + \Delta E$

(C.8) $\Delta X = \hat{u}_2 A_2 \Delta X + \hat{u}_2 A_2 X_1 - \hat{u}_1 A_1 X_1 + \hat{u}_2 \Delta D + \Delta \hat{u} D_1 + \Delta E$

(C.9) $[I - \hat{u}_2 A_2] \Delta X = \hat{u}_2 \Delta A X_1 + \hat{u}_2 A_1 X_1 - \hat{u}_1 A_1 X_1 + \hat{u}_2 \Delta D + \Delta \hat{u}_1 D_1 + \Delta E$

(C.10) $[I - \hat{u}_2 A_2] \Delta X = \hat{u}_2 \Delta A X_1 + \Delta \hat{u} [A_1 X_1 + D_1] + \hat{u}_2 \Delta D + \Delta E$

(C.11) $\Delta X = R^b{}_2 \hat{u}_2 \Delta A X_1 + R^b{}_2 \Delta \hat{u} [W_1 + D_1] + R^b{}_2 \hat{u}_2 \Delta D + R^b{}_2 \Delta E$

Where $R_2^b = [I - \hat{u}_2 A_2]$.

Laspeyres Version : Continuing from equation C.5 on:

(C.12) $\Delta X = \hat{u}_2 A_2 X_2 - \hat{u}_1 A_1 X_2 + \hat{u}_1 A_1 \Delta X + \hat{u}_2 D_2 - \hat{u}_1 D_2 + \hat{u}_1 \Delta D + \Delta E$

(C.13) $[I - \hat{u}_1 A_1] \Delta X = \hat{u}_2 [A_2 X_2 + D_2] - \hat{u}_1 A_1 X_2 - \hat{u}_1 D_2 + \hat{u}_1 \Delta D + \Delta E$

(C.14) $[I - \hat{u}_1 A_1] \Delta X = \hat{u}_2 [A_2 X_2 + D_2] - \hat{u}_1 [A_2 X_2 + D_2] + \hat{u}_1 \Delta A X_2 + \hat{u}_1 \Delta D + \Delta E$

(C.15) $[I - \hat{u}_1 A_1] \Delta X = \Delta \hat{u} [A_2 X_2 + D_2] + \hat{u}_1 \Delta A X_2 + \hat{u}_1 \Delta D + \Delta E$

(C.16) $\Delta X = R^b{}_1 \hat{u}_2 \Delta A X_2 + R^b{}_1 \Delta \hat{u} [W_2 + D_2] + R^b{}_1 \hat{u}_1 \Delta D + R^b{}_1 \Delta E$

(C.17) $M_1 = m_1\hat{}\ (D_1 + A_1 X_1)$

(C.18) $M_2 = m_2\hat{}\ (D_2 + A_2 X_2)$

(C.19) $M_2-M_1 = \Delta M = m_2\hat{}\ D_2 + m_2\hat{}A_2 X_2 - m_1\hat{}\ D_1 - m_1\hat{}\ A_1 X_1$

Paasche version:

(C.20) $\Delta M = m_2\hat{}\ D_1 + m_2\hat{}\Delta D + m_2\hat{}A_2 X_2 - m_1\hat{}\ D_1 - m_1\hat{}\ A_1 X_1$

(C.21) $\Delta M = m_2\hat{}\ D_1 - m_1\hat{}D_1 + m_2\hat{}\Delta D + m_2\hat{}A_2 X_1 + m_2\hat{}A_2 \Delta X - m_1\hat{}A_1X_1$

(C.22) $\Delta M = \Delta m\hat{}\ D_1 + m_2\hat{}\Delta D + m_2\hat{}A_2 X_1 - m_1\hat{}A_1X_1$

$+ m_2\hat{}A_2 [\ R_2^b\Delta\hat{u}\ [W_1 + D_1]\ ] + R_2^b\hat{u}_2\Delta A\ X_1 + R_2^b\hat{u}_2\Delta D + R_2^b\Delta E$

(C.23) $\Delta M = \Delta\ m\hat{}\ D_1 + [\ m_2\hat{} + m_2\hat{}A_2R_2^b\hat{u}_2\ ]\Delta D + m_2\hat{}\ A_2 X_1 - m_1\hat{}A_1X_1$

$- m_1\hat{}\ A_1 X_1 + m_2\hat{}\ A_2 R_2^b\ \Delta\hat{u}\ [W_1 + D_1] + m_2\hat{}\ A_2 R_2^b\hat{u}_2\Delta AX_1$

$+ m_2\hat{}\ A_2 R_2^b\ \Delta E$

Note that $\Delta\hat{u} = -\Delta\ m\hat{}$.

(C.24) $\Delta M = [\ m_2\hat{} + m_2\hat{}A_2R_2^b\hat{u}_2\ ]\Delta D + \Delta\ m\hat{}\ D_1 + m_2\hat{}A_1X_1 + m_2\hat{}\Delta A\ X_1$

$- m_1\hat{}\ A_1 X_1 - m_2\hat{}\ A_2 R_2^b\ \Delta\ m\hat{}\ [W_1 + D_1]$

$+ m_2\hat{}\ A_2 R_2^b\ \hat{u}_2\ \Delta A\ X_1 + m_2\hat{}A_2 R_2^b\Delta E$

(C.25) $\Delta M = [\ m_2\hat{} + m_2\hat{}A_2R_2^b\hat{u}_2\ ]\Delta D + \Delta\ m\hat{}\ [\ A_1 X_1 + D_1\ ]$

$+ m_2\hat{}\ \Delta A\ X_1 + m_2\hat{}\ A_2 R_2^b\ \hat{u}_2\ \Delta\ A\ X_1$

$- m_2\hat{}\ A_2 R_2^b\ \Delta\ m\hat{}\ [W_1 + D_1] + m_2\hat{}A_2 R_2^b\ \Delta E$

(C.26) $\Delta M = [\ m_2\hat{} + m_2\hat{}A_2R_2^b\hat{u}_2\ ]\Delta D$ (DDE)

$+ m_2\hat{}A_2 R_2^b\Delta E$ (EE)

$+ [\ I - m_2\hat{}A_2 R_2^b]\ \Delta\ m\hat{}\ [W_1 + D_1]$ (IS)

$+ m_2\hat{} + m_2\hat{}A_2R_2^b\hat{u}_2\ ]\Delta A\ X_1$ (TC)

Laspeyres version:

(C.27) $\Delta M = m_2\hat{}\ D_2 + m_2\hat{}\ A_2 X_2 - m_1\hat{}\ [\ D_2 - \Delta D] - m_1\hat{}\ [\ A_1 X_1\ ]$

(C.28) $$\Delta M = m_2\hat{} D_2 - m_1\hat{} D_2 + m_1\hat{} \Delta D + m_2\hat{} A_2 X_2 - m_1\hat{} [A_1 X_2] + + m_1\hat{} A_1 \Delta X$$

(C.29) $$\Delta M = m_2\hat{} [D_2 + A_2 X_2] - m_1\hat{} D_2 + m_1\hat{} \Delta D - m_1\hat{} [A_2 X_2] + m_1\hat{}\Delta A X_2 + m_1\hat{}A_1 \Delta X$$

(C.30) $$\Delta M = \Delta m\hat{} [D_2 + W_2] + m_1\hat{} \Delta D + m_1\hat{} \Delta A X_2 + m_1\hat{} A_1 [R_1^b \Delta\hat{u} [A_2 X_2 + D_2] + R_1^b \hat{u}_1 \Delta D + R_1^b \hat{u}_1 \Delta A X_2 + \Delta E]$$

Recalling that $\Delta\hat{u} = -\Delta m\hat{}$,

(C.31) $$\Delta M = [m_1\hat{} + m_1\hat{}A_1R_1^b\hat{u}_1] \Delta D \quad \text{(DDE)}$$
$$+ m_1\hat{}A_1 R_1^b\Delta E \quad \text{(EE)}$$
$$+ [I - m_1\hat{}A_1 R_1^b] \Delta m\hat{} [W_2 + D_2] \quad \text{(IS)}$$
$$+ m_1\hat{} + m_1\hat{}A_1R_1^b\hat{u}_1] \Delta A X_2 \quad \text{(TC)}$$

In equations C.26 and C.31, the DDE term shows the change in imports due to the changes in domestic final demand D, the EE term shows the change in imports caused by changes in exports E , where the import structure is kept constant. The IS term measures the changes in imports caused by the changes in the import structure m, of both final and intermediate use. The term TC gives the effect of the changes in the technological coefficients, i.e. the I-O cefficients matrix A. This shows the change in total import use due to the deepening and/or widening of interindustry relations as a result of technological change in production processes and substitution among inputs.

APPENDIX D

FIRST DIFFERENCES OF THE FOUR CAUSAL FACTORS: DDE, EE, IS AND TC

	DOMESTIC DEMAND EXPANSION	EXPORT EXPANSION	CHANGE IN IMPORT RATIO	CHANGES IN TECHNOLOGICAL COEFFICIENTS								
	ΔD	ΔE	Δm	ΔA								
AGRICULTURE	11.85	36.15	0.0193	0.0285	-0.0150	0.0054	-0.0054	-0.0068	-0.0005	-0.0000	0.0003	0.0124
MINING	2.06	-21.39	0.0354	0.0002	0.0007	0.0028	-0.0008	0.0008	0.0200	0.0009	0.0118	0.0001
FOOD	3.62	-95.80	0.1109	-0.0003	0.0002	0.0436	-0.0057	0.0002	-0.0012	-0.0001	0.0030	0.0006
TEXTILES AND LEATHER	5.24	75.28	0.0790	0.0011	-0.0014	-0.0040	0.0706	-0.0106	0.0002	-0.0015	-0.0001	-0.0000
LIGHT INTERMEDIATES	2.03	-40.89	0.0565	0.0004	0.0003	0.0024	-0.0011	0.0618	-0.0035	-0.0066	-0.0019	-0.0033
BASIC INTERMEDIATES	2.49	-111.70	0.1373	-0.0171	-0.0167	-0.0039	-0.0447	0.0067	0.0720	0.0366	-0.0689	-0.0020
MACHINERY	14.29	-122.15	0.1082	-0.0011	0.0089	0.0046	0.0002	0.0054	0.0122	0.0663	0.0284	0.0111
SOCIAL OVERHEAD	30.14	346.79	-0.0015	-0.0025	-0.0162	0.0199	-0.0041	0.0450	0.0018	0.0187	-0.0020	0.0174
SERVICES	28.28	33.71	-0.0055	0.0171	0.0167	-0.0471	0.0372	-0.0414	0.0087	-0.0164	0.0291	0.0321

Note : Sectoral Domestic Demand Expansion and Export Expansion figures are given as percentages of total changes in domestic demand and exports respectively. Column totals equal 100.

Source : Calculations based on the 1985 and 1990 I-O Tables in constant 1985 prices